Monitoring Common Loons for contaminants on the Kenai National Wildlife Refuge

by Liz Jozwiak

For many North Americans, loons are a symbol of clean air, clean water, and the solitude of the deep-woods wilderness.

But about 30 years ago, people noticed shrinking numbers of the common loon in parts of northeastern North America. Researchers began capturing loons on their breeding lakes in Southeast Canada in the mid-1990s to study them and monitor reproduction, and discovered that loons in certain areas of North America had high levels of mercury in their blood and feathers.

Mercury is released as a gas from a variety of human caused sources (e.g., coal burning plants and municipal incinerators), and is carried in the atmosphere. Mercury is deposited on the landscape where it can be methylated and then bioaccumulate and biomagnify in a variety of aquatic environments.

Contamination is highest in water bodies with low acid neutralizing capacity, and fluctuating water levels. These situations are likely to enhance the conversion of elemental mercury to methyl mercury (the toxic form).

It is now believed that most the atmospheric mercury that is deposited in Alaska comes across the Pacific Ocean from Asia, especially from the numerous coal burning power plants in China. Alaska loons will thus have the capacity to serve as monitors of this "Asian plume" as China brings more coal-fired power plants online in future years.

Recent studies by the non-profit group BioDiversity Research Institute have revealed that mercury levels in lower 48 common loons generally increase from west to east across North America, with the highest levels occurring in birds breeding in New England and eastern Canada. This western to eastern increase over North America is thought to occur because of wind direction and the numerous coal-burning power plants emitting mercury in the atmosphere across the continent.

High levels of mercury are associated with behavioral changes in Common Loons that can lead to decreased productivity, decreased survival of juvenile loons, and may be related to increased susceptibility to other diseases.

Significant behavioral differences occur in immature loons with high mercury levels, including increased preening and decreased time spent riding on the parents' backs. These behavioral changes result in increased exposure to predators and increased energy expenditure, contributing to decreased survival of young loons.

Blood and feather mercury levels in loon chicks are a good indication of mercury levels obtained from prey items acquired almost entirely on the lake they hatched from. In contrast, adult blood mercury levels reflect recent dietary uptake, while feather mercury levels reflect mercury that has been acquired over their lifetime.

Loons can rid their bodies of mercury by depositing mercury in feathers and eggs. Thus, with every molt, and for females, with every egg laid, body burdens of mercury are decreased. However, through continued ingestion of fish with a high mercury content, loons accumulate mercury faster than they can rid their bodies of it. This is particularly true for male loons, since they lay no eggs and, because of their larger size, they tend to eat larger fish than females.

In Alaska, the Kenai National Wildlife Refuge has

been working with Dr. Dave Evers, and other biologists from BioDiversity Research Institute (BRI) since the mid-1990s to capture and band Common Loons on refuge lakes as part of this long-term bio-monitoring study. In 2009, the Kenai NWR biology staff and loon biologists Lucas Savoy and Rick Gray of BRI captured and banded Common Loons from six previously monitored lakes.

Results of blood and feather mercury levels from Common Loons sampled on the Kenai NWR, and in the Mat-Su Valley in Alaska are the lowest in North America, and are considered to be a "reference or baseline value" because they have the lowest levels of measured mercury. Common Loons in the New England region have the highest.

Because Common Loons are long-lived fish eaters at the top of the food chain, impacts on a population may not be seen for many years. The Refuge plans to continue monitoring loons through this and other programs such as the citizen–based Kenai Loonwatch (www.AKloonwatch.net) to ensure that a healthy population continues into the future.

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